

Remarks

Reconsideration and withdrawal of the objections and rejections set forth in the Office Action are respectfully requested in view of the foregoing amendments and the following remarks:

The specification has been corrected in accord with the objections expressed in section 3 of the Office Action. Claim 10 has been rewritten to more positively recite the apparatus features, and to include the electronic data processing means of Claim 11, which has accordingly been cancelled, and all claims now recite in their preambles an apparatus rather than a system; minor grammatical changes have been made in Claims 7, 13 and 14,

With more particular reference to the specification, Applicants have presented herewith, for substitution, a reformatted version of Table 1; it is noted that the content of the Table has not been intentionally amended in any way. Applicants have corrected the spelling of "heroatomic," and have provided explanations for the acronym "TGA," GD system (the "D" should have been a "C"), and VISTA; the reference to Psichogios and Ungar has been removed, as superfluous, and an obviously necessary degree symbol has been inserted into the passage reproduced from page 4.

Applicants have not however amended the specification in regard to the expressions "FT-IR" and "FTIR," and they request reconsideration of the Examiner's position. First of all, it is common practice to omit the hyphen in instances in which the notation contains another hyphenated part, e.g., "TG-FTIR."; to that

extent, therefore, there is no inconsistency. Secondly, both expressions are standard in science and industry, and there is no ambiguity and no reason therefore why both expressions cannot be maintained in the specification. Having said the foregoing, however, if the Examiner feels strongly that consistency is essential, she is hereby authorized to include the hyphen in all instances in which the abbreviation "FTIR" appears without a supplemental hyphenated part.

With respect to the claim objections and rejections under 35 USC 112, it will be noted that all pending claims now recite in their preambles "apparatus" rather than "system." The issues raised are therefore obviated. Moreover, it will be appreciated that Claim 10 now more affirmatively defines the apparatus to include, as a first stage, a pyrolysis chamber and, as a second stage, a second chamber containing a catalyst. The claim also expressly requires electronic data processing means programmed to monitor the formation of at least one gas phase product for controlling the steps recited. Electronic data processing means programmed to effect specific functions is an *apparatus* limitation, to which the Examiner is obliged to accord full weight, inclusive of the functions by which the programmed electronic data processing means is characterized.

Turning now to the substantive rejections, the Examiner deems Claim 10 to have been anticipated by Chittick United States Patent No. 4,421,524. It is respectfully submitted that, even prior to amendment, the Chittick patent did not anticipate or render obvious the subject matter defined; and certainly, Claim 10, has herewith amended, is patentable over the reference.

In its original presentation, Claim 10 required the second stage of the apparatus to contain a catalyst. No true catalyst is taught, or suggested for use, in the apparatus or method of the Chittick patent.

It is recognized that char produced during the procedure described by Chittick can (like virtually any solid surface) promote reactions and thereby be considered to have a catalytic effect. However, the char present in the Chittick reactor is expressly and necessarily consumed, and hence is NOT a catalyst in the true sense of the word. Moreover, the properties of the char, and indeed, even the existence thereof, is wholly dependent upon the nature of the feedstock. Chittick cannot therefore properly be deemed to teach the use of a catalyst.

Secondly, in its original form Claim 10 required the reaction apparatus to be constructed for effecting recited process steps. Thus, the apparatus defined is constructed (i.e., have necessary features) to enable the introduction of a non-gaseous carbonaceous material into a pyrolysis chamber; it is constructed to enable the introduction of the primary fuel gas mixture and the pyrolysis mixture into the second chamber; it is constructed to enable withdrawal of the primary fuel gas mixture and the additional fuel gas from the second chamber; and it is constructed to enable the introduction of air, oxygen, carbon dioxide or steam into each of the chambers; indeed, such a feature is entirely foreign to Chittick. It seems obvious that the Chittick patent does not teach or suggest apparatus having the foregoing *structural features*, and it was error for the Examiner to accord them no weight.

Claim 10, as filed, also required the apparatus to enable the recited process steps to be carried out cyclically. Obviously, the Chittick patent neither teaches nor suggests apparatus that is constructed to permit cyclic operation of any steps, much less of the steps defined in Applicants' claim.

Moreover, the Chittick invention is limited to a method that is carried out as a continuous, steady-state process. In contrast, the batchwise, cyclical nature of the process for which claimed the apparatus is constructed allows for regeneration of the catalyst, and for activation of carbon in the first stage. In addition, in the claimed apparatus the solid material in the first stage is stationary, and is converted from a raw solid feed stock into a solid char residue, and the solid material in the second stage is also stationary and serves to crack the pyrolysis oil produced in the first chamber. In contrast, the Chittick apparatus is constructed only to enable processing and reaction in a moving bed, or mass, of solid material.

In addition to all of the foregoing (which alone clearly refute the Examiner's rejection) amended Claim 10 includes the subject matter originally presented in Claim 11, calling for electronic data processing means programmed to monitor the formation of at least one gas phase product for controlling the steps of the process. These limitations are totally unique to Applicants' apparatus, and could not possibly have been taught in or suggested by Chittick (which is devoid of *any* but the most rudimentary of control measures).

The Examiner acknowledges the foregoing deficiency, but asserts that it would have been obvious, to one of ordinary skill in the art, to modify Chittick by

employing the data processing means taught by Moriarty et al. as U.S. patent No. 5,993,751, "... for the purpose of increasing system flexibility and improving operation efficiency by allowing production of products having desired composition." This contention is completely without foundation or merit; the apparatus and method described by Chittick and Moriarty et al. are only superficially analogous to one another, and there is absolutely no basis for asserting that the control features taught by Moriarty et al. could be applied with beneficial effect (or could be applied at all) to the Chittick apparatus.

With regard to the subject matter of original Claim 11 and, as noted above, Chittick discloses only a continuous process, which is carried out with no ostensible concern for control and with no suggestion that any product should be analyzed to enable variation of any parameter. Indeed, there is no basis for concluding that any significant parameter of the Chittick process is susceptible of control. It can be speculated that, if any changes were to be made in order to modify the products obtained, Chittick might monitor the properties of the solid phase exiting the reactor. But doing so would introduce complex control problems would, in any event, hardly suggest the monitoring of the formation of one or more gas phase products to enable computer control of the steps carried out utilizing the instant apparatus.

The fact that Moriarty et al. may teach that variant process conditions will effect product composition, moreover, is virtually irrelevant since such general information is fundamental knowledge possessed by the person skilled in the art. If

the reference were to bear upon Applicants' invention, and even arguably be legitimately utilized in combination with Chittick, it would have to teach the use of computer control of steps that are the same as or equivalent to those for which Applicants' apparatus is designed, based upon gas monitoring, and it would have to do so in a system that is sufficiently similar to that of Chittick to be logically employed therewith. None of those conditions apply, and consequently the combination of references is wholly inadequate to provide a disclosure of the claim limitations here in question.

It is essential to note moreover that Moriarty et al. does not teach anything about the use of *feedback* control of a process in which process measurements are used to change process conditions in real time. The reference also does not teach anything about intelligent process control, which can be accomplished using artificial neural networks in which a control system can learn, and improve itself.

Moriarty et al. teaches only that by changes in temperature, auger speed and flow rate "the composition of the char or charcoal and other products may be varied." The focus of the patent is clearly on the properties of the char, with the gases being treated merely as byproducts; in contrast, gases are the primary products of the instant method, and char is a byproduct.

In regard to Claim 17, the Examiner contends that Chittick discloses (at lines 61-68 of each of columns 3 and 4) a system wherein a second chamber contains a catalyst, lacking only an explicit disclosure of a silica gel-based catalyst. In column 3, however, Chittick discloses: "Although charcoal is preferred, alumina

or brick material, or certain ceramics could be used.” He explains further that “This material forms a ‘base’ material on which the tars come to rest, after which the tars react further, as explained in more detail hereinabove.” This is hardly a disclosure of catalytic activity and, insofar as charcoal is concerned, it has been pointed out above that the material is consumed in the reaction and hence is not properly deemed a catalyst. That reaction is explicitly discussed in the passage in column 4, relied upon by the Examiner.

The Examiner contends that both Aldridge U.S. patent No. 3,816,298 and also Bayer U.S. patent No. 5,114,541 establish equivalency of catalyst used by Chittick with silica gel-based catalyst. Here again, Applicants respectfully submit that the Examiner’s assertion is clearly not correct.

At lines 35 and 36 of column 3, Aldridge expressly states: “The active catalytic component is believed to be the alkali metal.” Aldridge does not teach the use of silica gel as a *catalyst*, but rather as a catalyst *support* (column 3, lines 64-67) and, after identifying suitable alkali metal catalyst components, he discusses (in the paragraph bridging columns 3 and 4) the solid particulate support, which may include coke and activated carbon. Obviously, Aldridge does not establish equivalency between the char present in the Chittick method, on the one hand and, on the other hand, the catalyst to which his own invention is directed.

Furthermore, in the Aldridge process the catalyst is mixed with the feedstock, in the first stage. In the instant process, on the other hand, there is no ad-

mixture of catalyst with feedstock and, indeed, the catalyst is expressly present in the second stage chamber.

Bayer describes suitable conversion catalysts in the paragraph beginning at line 7 in column 2, and does disclose the use of silica gel. Again, however, no equivalency is drawn with the carbonaceous material of Chittick.

Moreover, as in the Aldridge process Bayer mixes the catalyst with the feedstock in the primary pyrolysis step, in which the temperature does not exceed 600° C. Again, in the present method the catalyst is used in a step carried out in the second stage and at high temperatures (900° to 1100° C) for cracking of the pyrolysis liquid into gases; i.e., the application of the catalyst is completely different.

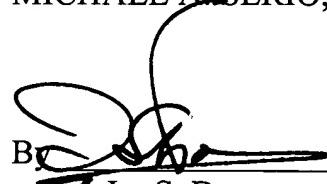
Finally, the Examiner rejects Claims 11-16 as having been obvious, to one of ordinary skill in the art, over Chittick in view of Moriarty et al., taken further in view of admitted prior art. The errors entailed in utilizing Moriarty to supplement Chittick, in respect of the computer control component recited in Applicants' claims, have been discussed above. Albeit Applicants do of course disclose the utilization of artificial neural network models, that disclosure certainly does not cure any of the very substantial deficiencies of the substantive rejections expressed by the Examiner, and this is particularly so in light of the inapplicability of such a model to the apparatus of the cited art, as discussed above.

In view of the foregoing, it is respectfully submitted that all claims of the instant application aptly define an apparatus that is novel and patentable over the

prior art. Withdrawal of the objections and rejections, and passage of the application aptly to allowance, are believed to be clearly in order; such actions are earnestly solicited.

Accompanying this Amendment is a Request for a Three-Month Extension of Time, together with payment of the requisite fee.

Respectfully submitted,  
MICHAEL A SERIO, ET AL.

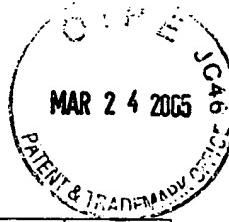
  
By \_\_\_\_\_  
Ira S. Dorman  
Attorney for Applicants  
Reg. No. 24,469  
Tel. (860) 528-0772

CERTIFICATE OF MAILING

I, IRA S. DORMAN, hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed as set forth above, on March 22, 2005.

  
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**Table 1. Elemental Analysis of Individual and Composite Samples (wt.%)**

Sample	Basis	Moisture	Ash	C	H	O	S	N
Polyethylene <sup>a</sup> (Aldrich)	DAF			85.7	14.3	0.0	0.0	0.0
Cellulose <sup>b</sup> (Avicel PH-102)	AR	5.0						
	D		<0.05	44.0	6.2	49.8	~0.0	~0.0
	DAF			44.0	6.2	49.8	~0.0	~0.0
Wheat Straw <sup>b</sup> (NIST)	AR	7.9						
	D		9.0	43.7	5.6	40.9	0.2	0.6
	DAF			48.0	6.2	44.9	0.2	0.7
Urea <sup>a</sup> (Aldrich)	DAF			20.0	6.7	26.6	0.0	46.7
Gerepon <sup>c</sup> TC-42 (Rhône-Poulenc)	D		7.6	55.9	10.6	10.6	10.6	4.7
	DAF			60.5	11.5	11.5	11.5	5.0
Methionine <sup>a</sup> (Aldrich)	DAF			40.3	7.4	21.4	21.5	9.4
Composite	D		3.8					
	DAF			48.7	8.2	31.0	3.4	8.7

Notes: AR = As-received; D= Dry; DAF = Dry, Ash Free

a = determined from chemical formula

b = determined by Huffman Laboratories (Golden, CO)

c = estimated from approximate chemical formula